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Capacitive Effects in Inductively Coupled Plasma Reactors PETER VITELLO, NICHOLAS TISHCHENKO, GERGORY PARKER, LLNL, Livermore, CA, MICHAEL BRANCH, Applied Materials, Santa Clara, CA — The physics of industrial plasma reactors operating with highly reactive gases is poorly understood. For optimum operation of such systems a more thorough understanding of the discharge physics and plasma chemistry must be achieved. With this goal in mind we have developed the two-dimensional time-dependent computer simulation code, INDUCT95. INDUCT95 has the ability to accurately and efficiently treat a wide range of plasma discharges including glow discharges, rf inductively coupled discharges, and rf capacitively coupled discharges. Comparison between simulations and experimental discharges in argon, chlorine, nitrogen, and other gases has shown excellent agreement. With current computer technology two-dimensional simulations are now beginning to be practical. We present results based upon the LLNL large area inductively coupled discharge experiment. The effects of rf coil capacitively coupling and rf substrate biasing are shown for argon and chlorine plasmas. Capacitive coupling leads to modifications in the time averaged plasma potential and enhanced ion energy losses. This results in significant variations in plasma spatial density profile, and in the ion flux and energy profiles at the substrate. Strong capacitive coupling may also generate a transition between the inductive mode and the capacitive mode of operation.

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